FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NO. PHD 99,200
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. Application No. (if known, see 37 CFR 1.5) 09/868386
INTERNATIONAL APPLICATION NO. PCT/EP00/10089	INTERNATIONAL FILING DATE October 11, 2000	PRIORITY DATE CLAIMED October 18, 1999

TITLE OF INVENTION
METHOD FOR THE OPERATION OF WIRELESS BASE STATIONS FOR PACKET TRANSFER RADIO SYSTEMS HAVING A GUARANTEED SERVICE QUALITY

APPLICANT(S) FOR DO/EO/US
BERNHARD WALKE, NORBERT ESSELING

Applicant(s) herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.

2. [ ] This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.

3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).

4. [ ] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. 371 (c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).

6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2))

7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.

8. [ ] A translation of the amendment to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).

9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98.

12. [X] An assignment document for recording. A separate cover sheet is compliance with 37 C.F.R. 3.28 and 3.31 is included.

13. [X] A FIRST preliminary amendment.
    [ ] A SECOND OR SUBSEQUENT preliminary amendment.

14. [ ] A substitute specification.

15. [X] A change of power of attorney and/or address letter.

16. [X] Other items or information:

    1 Sheets of Drawings

    X Authorthization Pursuant to 37 CFR § 1.136(a)(3) and to Charge Deposit Account

CERTIFICATE OF MAILING

[X] Express Mail Mailing Label No. EL686948878US
Date of Deposit June 18, 2001

I hereby certify that this paper and fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Natale a. Manzo — Natale A. Manzo
Typed Name — Signature

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) 09/868386	INTERNATIONAL APPLICATION NO. PCT/EP00/05640	ATTORNEY'S DOCKET NUMBER PHN 17,491

17 [ ] The following fees are submitted:

CALCULATIONS (PTO USE ONLY)

BASIC NATIONAL FEE (37 C.F.R. 1.492(A)(1)-(5)):

a 1	International preliminary-examination fee paid to USPTO (37 C.F.R. 1.482)	$690.00	
a 2	No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)	$710.00	
a 3	Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2)) paid to USPTO	$1000.00	
a 4	International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)	$100.00	
a 5	Search Report has been prepared by the EPO or JPO	$860.00	
	ENTER APPROPRIATE BASIC FEE AMOUNT =		$1000.00

Surcharge of $130.00 for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).				$130.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	15 - 20 =		X $ 18.00	$	
Independent claims	1 - 3 =		X $ 80.00	$	
MULTIPLE DEPENDENT CLAIMS (if applicable)			+ $260.00	$	
TOTAL OF ABOVE CALCULATIONS =				$1130.00	
Reductions by 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
SUBTOTAL =				$1130.00	
Processing fee of $130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 C.F.R. 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$1130.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28,3.31). $40.00 per property +				$40.00	
TOTAL FEES ENCLOSED =				$1170.00	
				Amount to be refunded	$
				charged	$1170.00

a. [ ] A check in the amount $_____ to cover the above fees is enclosed.

b. [X] Please charge my Deposit Account No.14-1270 in the amount of $1170.00 to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fee, with the exception of the Base Issue Fee, which may be required, or credit any overpayment to Deposit Account No. 14-1270. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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(SIGNATURE)

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(NAME)

39,703
(REGISTRATION NUMBER)

DATE OF MAILING: June 18, 2001

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

BERNHARD WALKE ET AL.

Atty. Docket

PHD 99,200

Serial No.

Group Art Unit

Filed: CONCURRENTLY

Ex.

Title: METHOD OF THE OPERATION OF WIRELESS BASE STATIONS FOR PACKET TRANSFER RADIO SYSTEMS HAVING A GUARANTEED SERVICE QUALITY

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to calculation of the filing fee and examination, please amend the above-identified application as follows, where marked-up versions of the amended claims 3-15 are attached as Appendix A:

IN THE CLAIMS

Please amend the claims as follows:

3. (Amended) A method as claimed in claim 1, characterized in that the organization of the partial frame structures is effected by a decentralized control in the relay station (FMT).

4. (Amended) A method as claimed in claim 1, characterized in that the organization of the partial frame structures is partly effected by a central controller in the central station (AP) and partly by a decentralized controller in the relay station (FMT).

5. (Amended) A method as claimed in claim 1, characterized in that a mobile terminal (MT) can become the AP and take over the role of a central station (in so far this is possible with the system), while there are RMTs with respect to the AP.

6. (Amended) A method as claimed in claim 1, characterized in that a cascading of the relay function is possible while a station controlled as an RMT seen from the point of view of an FMT can simultaneously be an FMT with respect to another station, and in the original partial frame structure further partial frame structures are recursively formed of which the depth corresponds to the number of the hops used between AP and the most remote RMT in the cascade.

7. (Amended) A method as claimed in claim 1, characterized in that a central station (AP) can cover a plurality of terminals (MT) and relay stations (FMT) while each MT can have the functionality of an FMT.

8. (Amended) A method as claimed in claim 1, characterized in that the FMT can simultaneously cover a plurality of RMTs.

9. (Amended) A method as claimed in claim 1, characterized in that the assignment of the capacity for the relay path in the time domain (TDMA) can be effected in suitable systems, but also in the frequency domain (FDMA) or code domain (CDMA).

10. (Amended) A method as claimed in claim 1, characterized in that there may be a plurality of FMTs that simultaneously cover their associated RMTs in various areas of the cell, while partial frames are simultaneously transmitted at different spots in the cell.

11. (Amended) A method as claimed in claim 1, characterized in that the length of the frames of AP and partial frames of FMT can dynamically vary and be different.

12. (Amended) A method as claimed in claim 1, characterized in that the arrangement of the individual phases in the partial frames is dynamically changed, divided, can partly fail and new phases can additionally be defined.

13. (Amended) A method as claimed in claim 1, characterized in that a direct exchange of data is effected between the associated RMTs by controlling a common FMT.

14. (Amended) A method as claimed in claim 1, characterized in that a direct exchange of data is effected between MT, controlled by the AP, and RMT, controlled by the associated FMT.

15. (Amended) A method as claimed in claim 1, characterized in that a point-to-multipoint mode is used for transferring useful data.

REMARKS

The claims have been amended to delete multiple dependencies. The above amendments are submitted to place this application in proper U.S. format. Entry of the amendment and an early action on the merits are solicited.

Respectfully submitted,

By _____
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Attorney
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June 18, 2001

Appendix A

Version with Markings
to Show Changes Made to the Claims

The following are marked up versions of amended claims 3-15 are attached as Appendix A:

3. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the organization of the partial frame structures is effected by a decentralized control in the relay station (FMT).

4. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the organization of the partial frame structures is partly effected by a central controller in the central station (AP) and partly by a decentralized controller in the relay station (FMT).

5. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a mobile terminal (MT) can become the AP and take over the role of a central station (in so far this is possible with the system), while there are RMTs with respect to the AP.

6. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a cascading of the relay function is possible while a station controlled as an RMT seen from the point of view of an FMT can simultaneously be an FMT with respect to another station, and in the original partial frame structure further partial frame structures are recursively formed of which the depth corresponds to the number of the hops used between AP and the most remote RMT in the cascade.

7. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a central station (AP) can cover a plurality of terminals (MT) and relay stations (FMT) while each MT can have the functionality of an FMT.

8. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the FMT can simultaneously cover a plurality of RMTs.

9. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the assignment of the capacity for the relay path in the time domain (TDMA) can be effected in suitable systems, but also in the frequency domain (FDMA) or code domain (CDMA).

10. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that there may be a plurality of FMTs that simultaneously cover their associated RMTs in various areas of the cell, while partial frames are simultaneously transmitted at different spots in the cell.

11. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the length of the frames of AP and partial frames of FMT can dynamically vary and be different.

12. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that the arrangement of the individual phases in the partial frames is dynamically changed, divided, can partly fail and new phases can additionally be defined.

13. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a direct exchange of data is effected between the associated RMTs by controlling a common FMT.

14. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a direct exchange of data is effected between MT, controlled by the AP, and RMT, controlled by the associated FMT.

15. (Amended) A method as claimed in claim 1 [one of the preceding claims], characterized in that a point-to-multipoint mode is used for transferring useful data.

Method for the operation of wireless base stations for packet transfer radio systems having a guaranteed service quality

The invention relates to a novel method of increasing the supply ranges of packet oriented transferring radio stations, which are located outside the range of a central base station and are supplied by wireless base stations that have a relay function. In contrast to conventional wireless transfer systems, a communications service quality is guaranteed, which service quality is featured by parameters such as effective data transfer rate, packet delay time, variation of the packet delay time, and so on. Practical fields of application for such systems may be, for example:

- Local Area Networks for the data and multi-media communication,
- Access networks to telecommunications networks,
- Networks for connecting fixed and mobile subscribers, and for interconnecting mobile subscribers.

In future radio systems different services are dynamically rendered available to the user of a telecommunications service. These services are different as regards requirements of the service quality and the required transmission capacity. For the assignment of the capacity necessary for the transmission of data (including video and audio) to the stations that wish to transmit, various approaches in radio systems are known:

- Uncoordinated access (for example, HIPERLAN type 1 [3] or IEEE 802.11 [7]). With this type of access the stations wishing to transmit access a radio channel in uncoordinated fashion. Co-ordination is obtained by a decentralized strategy of assignment, without central assignment. In these systems, service quality can be guaranteed only with certain probability or not guaranteed at all.
- Exclusive assignment of transmission capacity in the time/code/frequency range to a station that wishes to transmit, while a distinction is made between two main groups:
  - The capacity is assigned in a connection-oriented manner by means of a channel that has a fixed transmission rate and is therefore also simultaneously exclusively reserved for the duration of the connection (for example, GSM [2] with the exception of GPRS [4]).

- The capacity is dynamically assigned by the base station to the individual associated stations, depending on their requirements [8], [1], [5], [4], while multicell systems are possible. This assignment is controlled by a central station, which is either known initially [5], or determined by a system itself [6]. In order to guarantee a service quality, special measures (call accept and scheduling, [8]) are necessary.

In the following part, radio networks with a central controller are discussed. An assignment of transmission capacity by a central assignment point for a station that wishes to transmit/receive (Mobile Terminal (MT). A mobile terminal which, however, may also act as a base station) is only possible if the MT is located in the coverage area of the base station. An MT not located in the coverage area is called a Remote Mobile Terminal ((RMT). An MT, whose radio relay conditions do not permit a direct radio link to the Access Point (AP). The RMT may have extended functions compared to the MT). Reasons for the insufficient radio coverage of the RMT may be, for example, a large distance from the central base station ((Access point (AP). A central station which may be stationary or mobile. This station organizes a network assigned to it. The role of the central station may change in several systems (for example, ad hoc HIPERLAN 2 [6]).), electromagnetic interference, level breakdown as a result of shadowing of the radio waves by obstacles, and multi-path propagation. If, however, the RMT can have a sufficient receiving quality of the data from another station (Forwarder Mobile Terminal (FMT). An MT that can additionally take over the tasks of a relay station and thus become a wireless base station), which other station maintains a direct or indirect connection to the AP, and can send data thereto, the RMT can, according to the invention, be controlled by the base station.

The new method controls the communication between FMT and MT or RMT respectively, with the object of putting RMT in the same category as an MT as regards service quality.

The method permits the sequential linking of a plurality of relay connections, for example, AP ↔ FMT ↔ ... ↔ FMT ↔ RMT. An FMT compares to the higher-order FMT, which is closer to AP, as an MT, and compares to the lower-order FMT as an AP.

The invention utilizes a common time-interlocking capacity assignment. The capacity assignment for stations that can be directly reached by the AP (FMT, MT) is realized from the base station (AP) (for example [5]). This is the first radio path (hop) seen from the base station. This may be an active or passive (sleeping), connection-oriented or

connectionless, packet-oriented data link or signaling link. The control data of the AP for the radio channel to be occupied by AP, MT and FMT of the first hop are cyclically transmitted in predetermined distances, or dynamically in announced or known distances. The AP enables all the MTs and FMT to have a random access in its coverage area, while the result of the access is explicitly or implicitly announced to the stations. In case of collisions, mechanisms for collision solution are used. This type of dynamic capacity assignment is state of the art and explained in, for example, [1], [8], [5].

This type of channel assignment is extended in this invention in that separate MTs act as wireless base stations and, in addition, serve as a relay station (FMT) and as against RMTs appear as Aps, but against Aps appear as MTs.

The FMT utilizes the transmission capacity assigned by the AP partly for its own purpose and partly to enable the FMT-controlled RMT to transmit to the AP via a second radio path according to the same or similar rules to those used by the AP.

Each relay station used as an FMT embodies a partial frame structure which is embedded in the frame structure predefined by the higher-order central station. For the partial frame structure only the capacity assigned to the FMT is used. The partial frame structure is similar to the higher-order frame structure, so that a communication to unchanged MTs, but also to specially adapted stations, is possible. This means that the partial frame structure for its part contains areas in which occupied capacity is announced, a data transfer to the MT (or RMT, respectively) can take place (remote downlink) as well as a data transfer from the MT (or RMT, respectively) to the FMT (remote uplink). Also a random access is rendered available. The subdivision into partial frame structures may be effected recursively i.e. more than one relay links can be cascaded. The control of the communication and of the capacity occupations on the individual hops may be carried out by:

- The base station (AP), which controls the transmission capacity for all the stations connected to it directly or indirectly i.e. by relay links or cascaded relay links. The relay stations (FMT) then have the object of relaying the reservation of the transmission capacity determined by the base station to the RMTs, and accordingly constructing the partial frames.
- Irrespectively of each other, by the AP for its MTs and FMTs and by the FMTs for their RMTs. Each FMT gets capacity from the AP and manages this capacity autonomously like an AP. In existing systems (for example, H/2 [5]) this may be the uplink area assigned to this FMT. This procedure offers the advantage that no change needs to be made in existing systems (more particularly, AP and MT), because the partial frame

structure is fully integrated with the frame structure that already exists. Only the new functions of the FMT are added. The transmission capacity assigned to the FMT is managed largely autonomously by the FMT and organized so that the RMTs reach the AP via the FMT or are reached by the AP, respectively.

- Any random combination of control by FMT and AP.

To realize the FMT it is sufficient, based on the time-dependent structure i.e. division of the transmission capacity into a time-dependent frame structure and a subdivision into further time-dependent partial frame structures, to have only one transceiver portion. Where appropriate, a plurality of transceiver portions per FMT can be used. The length of the frames of the AP and partial frames of the FMT may vary dynamically and have different lengths. Also a dynamic reassignment of the phases within the frames is possible, which reassignment also includes the lacking of several phases and the use of new phases. Furthermore, the phases may be used for data transmission in the point-to-multipoint mode. In addition to this mode it is possible to organize a direct data transmission between individual RMTs and between RMT and MT, which do not operate as an FMT.

In addition to the assignment of time ranges (TDMA) for the partial frames, also an assignment of frequency ranges (FDMA) and code ranges (CDMA) is possible. The decisive factor is that the central base station divides its available capacity into sub-capacities, which on their part are assigned to the individual relay stations (FMT). For this purpose, the above-described management of these sub-ranges and the assignment of individual parts of these sub-ranges to the MTs or RMTs is used. In suitable systems (for example, H/2 ad hoc [6]), each MT can additionally become an AP, while with respect to this there are again RMTs.

With suitable radio conditions it is also possible with the proposed method to provide a space-dependent assignment of transmission capacity, so that the partial frame structure is simultaneously used at different locations of the centrally controlled network.

To guarantee a requested service quality, the possibility of the specific and organized assignment of transmission capacity is a condition. Adhering to the service quality is the task of the units (AP, FMT), which control a distribution of the available capacity for the transmission of the individual stations. Suitable strategies are basically already known [8] and can be adapted for this invention. The necessary changes consist of taking the necessary capacity into account for the organization of the individual partial frame structures, as they have been described above.

An example of embodiment is shown in the drawings and will be described in more detail in the following. As an example for the invention, an extension of the HIPERLAN 2 (H/2) system [5] is further discussed, in which:

Fig. 1 shows a scenario to be used for the invention and the arrangement of the respective stations,

Fig. 2 hows the H/2-system frame structure on the radio interface, and

Fig. 3shows the frame structure relevant to the invention as it is proposed in this invention as an example for H/2.

Fig. 1 shows a situation by way of example as it may occur in packet transfer radio networks. An H/2 system is shown, which works in the so-called centralized mode i.e. the individual terminals of the system are controlled by the base station (AP). In addition, there is the direct mode, in which mobile terminals controlled by the AP can directly communicate with one another. The direct mode assumes that all the terminals of a cell can receive the organization information directly from the AP. If it is assumed that r is the radius of the cell in which the individual MTs can receive the AP and can also exchange information with the AP, the RMTs outside this radius, or due to the radio conditions, respectively, are unable to exchange data with the AP.

The invention looks at solutions for connecting RMTs via APs. A precondition for this is that the RMT is located within the radius r_f around an MT. These MTs are then used as relay stations (FMT), which form a bridge between AP and RMT and can bidirectionally transfer data. The transfer of the data is controlled by the AP in the H/2 system. For this purpose, a periodic frame structure is transmitted, which is divided into several sub-ranges. In Fig. 2 the time-dependent structure is shown as it is used in the H/2 system.

First, general information about the cell and the associated AP is transmitted in the so-called Broadcast Channel (BCH). Then, the AP transmits organization data in the Frame Control Channel (FCCH) about the future occupation of the remaining MAC frame, whose overall length in H/2 is constantly 2 ms. In the Acknowledge Channel (ACH) that follows, the terminals are informed of the result with respect to the access to the channel to be explained in the following, the random access. This is followed by the downlink phase, in which data are transmitted from the AP to the individual MTs. These data can be transmitted

in long protocol data units of 54 bytes, Long Channel (LCH) or short data units of 9 bytes, Short Channel (SCH). In addition, it is possible for the individual data units to be combined to data trains. In the uplink phase the individual mobile terminals have the opportunity to transmit their data to the AP. At what instant each individual terminal is allowed to send is announced already in the FCCH. At the end of the MAC frame there is a phase in which all the terminals are allowed to access the radio channel at random according to specific rules. This phase is referred to as Random Access Channel (RACH) and is laid down in H/2.

Fig. 3 shows the extension of a MAC frame by a partial frame for relay operation, as defined for the H/2 system in this invention. The MAC frame is defined by the AP and to the FMT is assigned a certain transmission capacity on the uplink, which capacity can be assigned at random by the FMT via a partial frame for the transmission of its own UL data to the AP, and the transmission of UL/DL data between FMT and RMTs. The AP sees this partial frame as an FMT uplink slot, while it is ensured by a suitable featuring of the data packets, that the AP does not interpret data, which are transmitted in this phase for the relay link from the FMT to the RMT, as uplink data of the FMT. In the partial frame again the individual phases of the H/2 are used, but in a form adapted to the sub-structure.

In this example the FMT first transmits the information necessary for the organization of the data link in the Forwarder Broadcast Channel ((F-BCH), a broadcast channel which is generated by the FMT and received by the RMTs). Then, the RMTs are informed of the further structure of the partial frame in the Forwarder Frame Control Channel (F-FCH). In the subsequent Forwarder Acknowledge Channel (F-ACH), the RMTs are informed of the result for a transmission on the F-RACH to be explained hereinafter. Then the Forwarder Downlink phase (FDL) takes place, in which the FMT sends data to the addressed RMTs. This may be effected in a random sequence of Long Channel (LCH) data packets, (data packets of 54 bytes) or Short Channel (SCH) data packets, (data packets of 9 bytes). The individual packets may then also be combined to packet trains. After a change-over time for the transceiver of the FMT, the FMT can receive data in the Forwarder Uplink (F-UL, this is a link from RMT → FMT) from an RMT. Again random sequences of LCH and SCH data packets may show up then. In the F-RACH phase the RMTs can send data to the FMT at random, which happens in the partial frame defined in this invention by analogy with the mechanisms for random access already laid down for H/2. Subsequent to the phases for the relay link, the FMT connects its own uplink to transmit data to the central station of the system. Standard mechanisms of the H/2 are used then.

The organization of the partial frame may be effected autonomously by the FMT, but also be controlled by the AP. The FMT is a wireless H/2 base station. The RMT is a wireless terminal (MT) as defined in accordance with the H/2 standard.

It is furthermore possible to again define a partial frame for a cascaded relay link in the F-DL phase of the FMT. This provides a recursive structure of partial frames, whose depth corresponds to the number of sub-links (hops).

The partial frame may have the same length as the frames of the AP, or a different length. It seems to be efficient to have the FMT periodically generate the partial frame with the same timing as the AP, but with a respective offset, compare Fig. 3.

Literature

[1] DE 195 35 329 A1

[2] ETSI *Digital cellular telecommunication; Mobile Station - Base Station System (MS-BSS) interface; General Aspects and principles, GTS GSM 04.01.* European Telecommunications Standards Institute, November 1996.EN.

[3] *Local Area* ETSI *Broadband Radio Access Network (BRAN); High Performance Radio Network (HIPERLAN) Type 1; Functional Specification V1.2.1, EN 300 652.* European Telecommunications Standards Institute, September 1998.EN.

[4] ETSI *Digital cellular telecommunication (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS radio interface, TR 101 350, (GSM 03.64).* European Telecommunications Standards Institute, October 1998.EN.

[5] ETSI *Broadband Radio Access Networks (BRAN); HIPERLAN Type 2, Functional Specification Data Link Control (DLC) Layer Part 1 - Basic Data Transport Function, DTS/BRAN030003-1 VO.i* European Telecommunications Standards Institute, September 1999.DTS

[6] ETSI *Broadband Radio Access Networks (BRAN); HIPERLAN Type 2 Functional Specification Data Link Control (DLC) Layer Part 4 - Extension for Home Environment, DTS/BRAN-0020004-4 V0.a.* European Telecommunications Standards Institute, August 1999.DTS

[7] IEEE *Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications Broadband Radio Access Network (BRAN);* Standard 802.11, IEEE, New York, November 1997.EN

[8] D. Petras *Entwicklung und Leistungsbewertung einer ATM-Funkschnittstelle.* Aachener Beiträge zur Mobil- und Telekommunikation, Band 18, Wissenschaftsverlag Mainz, Aachen, 1999.

CLAIMS:

1. A method with wireless base stations in centrally controlled radio systems, which systems transfer packets and guarantee service quality and comprise a controlling base station (AP), mobile terminals (MT) and stations working as a relay (FMT) for the connection of a station (RMT) not connected to the AP by radio for bidirectional communication between RMT and AP, the FMT maintaining both a connection to the AP and to the RMT by radio, characterized

(a) in that a time-shifted partial frame structure is generated by the FMT based on a system-wide known frame structure of the AP, which partial frame structure is used by the FMT to control the transmission from the FMT to the RMT and back, while the partial frames transport signaling data, useful data and organization data about the structure of the partial frame for controlling the transmission between FMT and RMT to enable a communication between RMT and AP, and

(b) in that the structure of the partial frame is so similar to the frame generated by the AP that an MT, which is designed for the operation at an AP, can also serve as an RMT and permits the exchange of data between RMT and FMT.

2. A method as claimed in claim 1, characterized in that the organization of the partial frame structures is exclusively effected by a central controller in the AP.

3. A method as claimed in one of the preceding claims, characterized in that the organization of the partial frame structures is effected by a decentralized control in the relay station (FMT).

4. A method as claimed in one of the preceding claims, characterized in that the organization of the partial frame structures is partly effected by a central controller in the central station (AP) and partly by a decentralized controller in the relay station (FMT).

5. A method as claimed in one of the preceding claims, characterized in that a mobile terminal (MT) can become the AP and take over the role of a central station (in so far this is possible with the system), while there are RMTs with respect to the AP.

6. A method as claimed in one of the preceding claims, characterized in that a cascading of the relay function is possible while a station controlled as an RMT seen from the point of view of an FMT can simultaneously be an FMT with respect to another station, and in the original partial frame structure further partial frame structures are recursively formed of which the depth corresponds to the number of the hops used between AP and the most remote RMT in the cascade.

7. A method as claimed in one of the preceding claims, characterized in that a central station (AP) can cover a plurality of terminals (MT) and relay stations (FMT) while each MT can have the functionality of an FMT.

8. A method as claimed in one of the preceding claims, characterized in that the FMT can simultaneously cover a plurality of RMTs.

9. A method as claimed in one of the preceding claims, characterized in that the assignment of the capacity for the relay path in the time domain (TDMA) can be effected in suitable systems, but also in the frequency domain (FDMA) or code domain (CDMA).

10. A method as claimed in one of the preceding claims, characterized in that there may be a plurality of FMTs that simultaneously cover their associated RMTs in various areas of the cell, while partial frames are simultaneously transmitted at different spots in the cell.

11. A method as claimed in one of the preceding claims, characterized in that the length of the frames of AP and partial frames of FMT can dynamically vary and be different.

12. A method as claimed in one of the preceding claims, characterized in that the arrangement of the individual phases in the partial frames is dynamically changed, divided, can partly fail and new phases can additionally be defined.

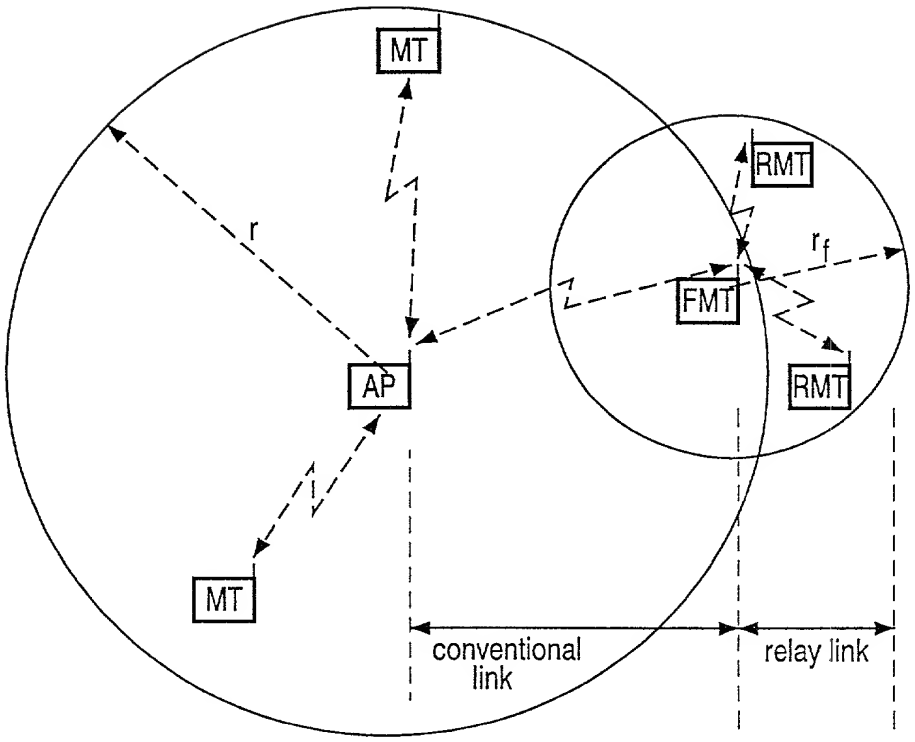
13. A method as claimed in one of the preceding claims, characterized in that a direct exchange of data is effected between the associated RMTs by controlling a common FMT.

14. A method as claimed in one of the preceding claims, characterized in that a direct exchange of data is effected between MT, controlled by the AP, and RMT, controlled by the associated FMT.

15. A method as claimed in one of the preceding claims, characterized in that a point-to-multipoint mode is used for transferring useful data.

ABSTRACT:

A method for the operation of wireless base stations for packet transfer radio systems having guaranteed service quality. A novel method of increasing the supply ranges of packet oriented transferring radio stations, which are located outside the range of the central base stations and are supplied by wireless base stations (relay stations). In contrast to conventional wireless transfer systems, a communications service quality is guaranteed. The invention uses a common time interconnected capacity assignment method. Said capacity assignment is generated for a base station (AP) by stations (MT, FMT) which can be reached directly. Individual MTs are present in the form of wireless base stations and serve as relay stations (FMTs) for the MTs outside the range of an AP. For an AP, FMTs appear as MTs. The FMT forms a partial frame structure in a part of the AP distribution capacity transfer system, which is embedded in the time frame structure dictated by the commanding central station. Adherence to a required service quality guarantee is achieved by capacity assignment algorithms. Wireless, packet-oriented wireless networks.



legend: AP Access Point
MT Mobile Terminal
FMT Forward Mobile Terminal
RMT Remote Mobile Terminal

FIG. 1

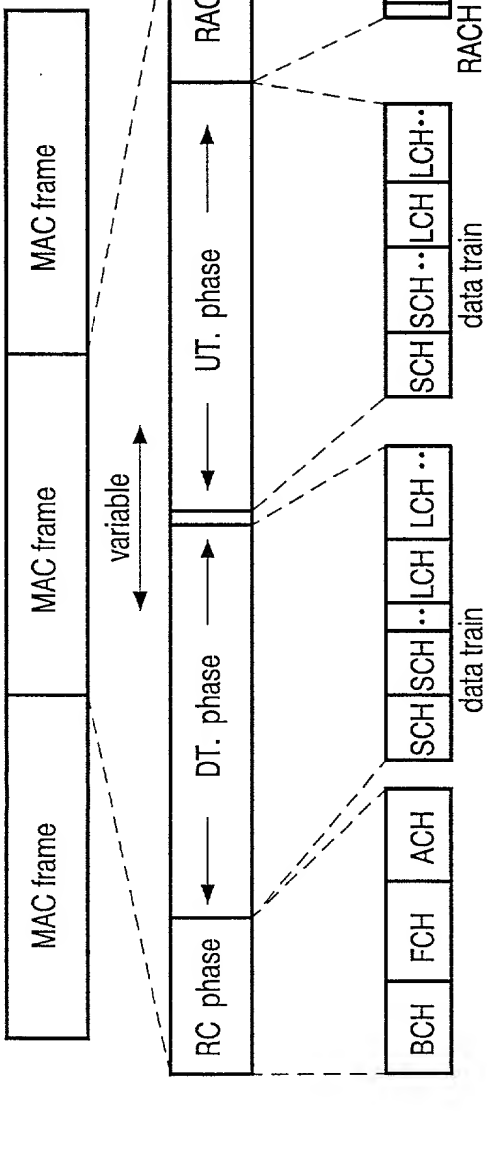

MAC frame
MAC frame
MAC frame
variable
RC phase
DT. phase
UT. phase
RACH
BCH
FCH
ACH
SCH
SCH
LCH
LCH
data train
SCH
SCH
LCH
LCH
data train
RACH slots
legend:
BC Broadcast Phase for MT(FMT)
DL Downlink AP -> MT (FMT)
UL Uplink MT(FMT) -> AP
RACH Random Access Channel for MT(FMT)
BCH Broadcast Channel for RMTs
SCH Short Channel 9 byte packet
LCH Long Channel 54 byte packet
ACH Anknowledge Channel RACH for MT

FIG. 2

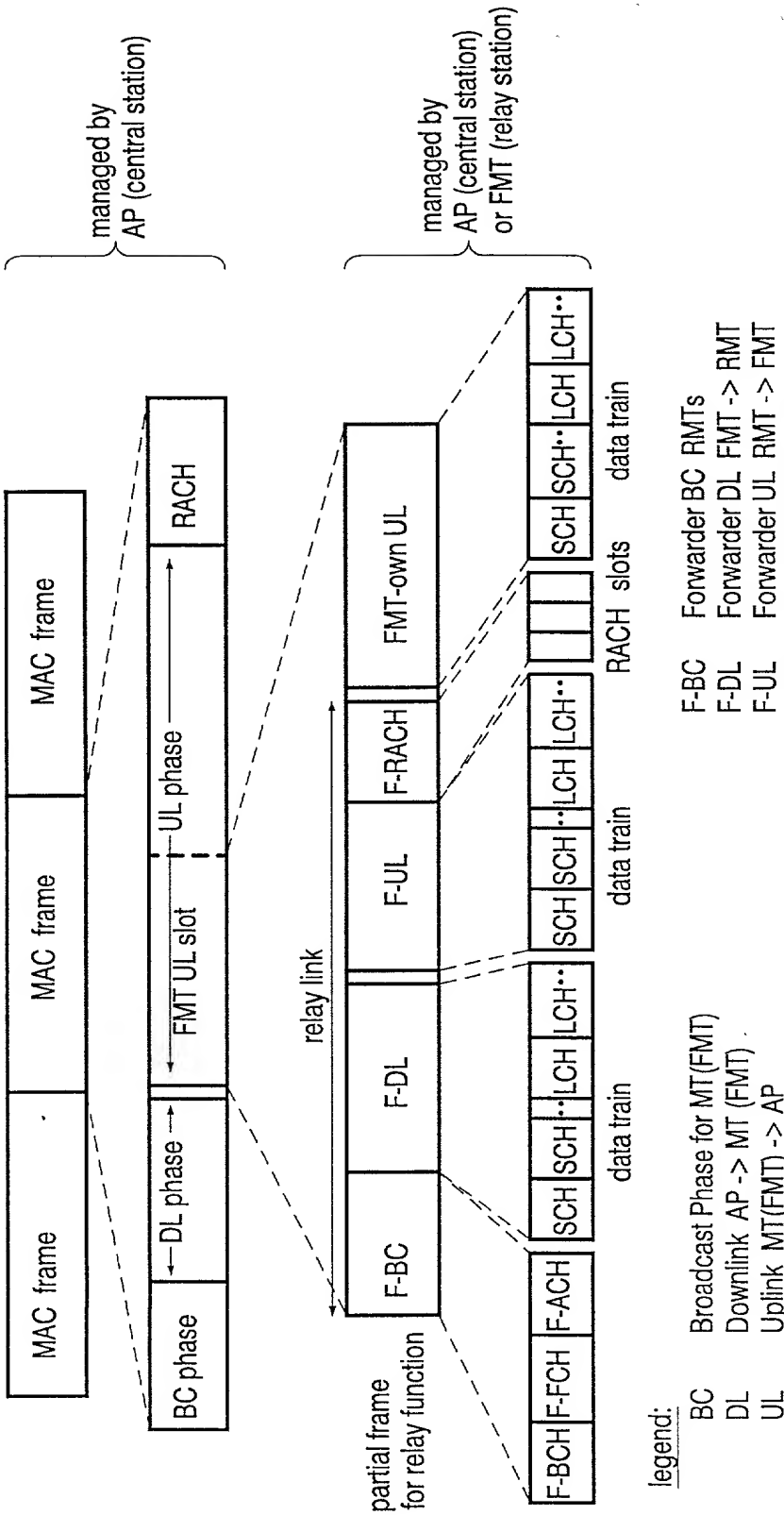

MAC frame
MAC frame
MAC frame
managed by
AP (central station)
BC phase
DL phase
FMT UL slot
UL phase
RACH
relay link
F-BC
F-DL
F-UL
F-RACH
FMT-own UL
managed by
AP (central station)
or FMT (relay station)
partial frame
for relay function
F-BCH
F-FCH
F-ACH
SCH
SCH
LCH
LCH
data train
RACH slots
data train
legend:
BC Broadcast Phase for MT(FMT)
DL Downlink AP -> MT (FMT)
UL Uplink MT(FMT) -> AP
RACH Random Access Channel MT(FMT)
F-BC Forwarder BC RMTs
F-DL Forwarder DL FMT -> RMT
F-UL Forwarder UL RMT -> FMT
F-BCH Forwarder BCH RMT
F-FCH Forwarder FCH RMT
F-ACH Forwarder ACH for RMT
F-RACH Forwarder RACH RMT

FIG. 3

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (includes Reference to PCT International Applications)	ATTORNEY'S DOCKET NUMBER **PHD 99.200 US**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

the specification of which (check only one item below):

☐ is attached hereto.

☐ was filed as United States application

Serial No _____

on _____

and was amended

on _____

☒ was filed as PCT international application

Number PCT/EP00/10089 ✓

on 11 October 2000 ✓

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY	APPLICATION NUMBER	DATE OF FILING DAY, MONTH, YEAR	PRIORITY CLAIMED UNDER 35 USC 119
Germany ✓	**19950005.3** ✓	**18 October 1999** ✓	**YES**

Combined Declaration For Patent Application and Power of Attorney (Continued) (includes Reference to PCT International Applications)	Attorneys Docket Number **PHD 99.200 US**

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

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	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
204	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
205	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true: and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 if Title 18 of the United states Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201 CITY Bernhard Walke	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
DATE 10 May 2001	DATE	DATE
SIGNATURE OF INVENTOR 204 W. Esseling	SIGNATURE OF INVENTOR 205	
DATE 10 May 2001	DATE	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

BERNHARD WALKE ET AL.

Serial No.

Filed: CONCURRENTLY

Atty. Docket

PHD 99,200

Group Art Unit

Ex.

Title: METHOD OF THE OPERATION OF WIRELESS BASE STATIONS FOR PACKET TRANSFER RADIO SYSTEMS HAVING A GUARANTEED SERVICE QUALITY

Commissioner for Patents
Washington, D.C. 20231

APPOINTMENT OF ASSOCIATES

Sir:

The undersigned Attorney of Record hereby revokes all prior appointments (if any) of Associate Attorney(s) or Agent(s) in the above-captioned case and appoints:

DICRAN HALAJIAN **(Registration No. 39,703)** and

JACK D. SLOBOD **(Registration No. 26,236)**

c/o U.S. PHILIPS CORPORATION, Intellectual Property Department, 580 White Plains Road, Tarrytown, New York 10591, his Associate Attorney(s)/Agent(s) with all the usual powers to prosecute the above-identified application and any division or continuation thereof, to make alterations and amendments therein, and to transact all business in the Patent and Trademark Office connected therewith.

ALL CORRESPONDENCE CONCERNING THIS APPLICATION AND THE LETTERS PATENT WHEN GRANTED SHOULD BE ADDRESSED TO THE UNDERSIGNED ATTORNEY OF RECORD.

Respectfully,

Michael E. Marion, Reg. 32,266
Attorney of Record

Dated at Tarrytown, New York
this 18TH day of June, 2001.

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